UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

July 27, 2000

Maryann Baird, Project Manager
US Army Corps of Engineers
Seattle District
P.O. Box 3755
Seattle, Washington 98124-2255

Re: Endangered Species Act Section 7 Formal Consultation
Ernie Ufer - Pier, Ramp and Float Installation, NMFS No. WSB-99-518; and
Christopher Carter - Pier, Ramp and Float Installation, NMFS No. WSB-99-519

Dear Ms. Baird:

This document transmits the National Marine Fisheries Service's (NMFS) Biological Opinions and incidental take statements based on our review of the proposed installation of two pier, ramp and float facilities on the south shore of Hood Canal and their effects on Puget Sound chinook (*Oncorhynchus tshawytscha*) and Hood Canal summer chum (*Oncorhynchus keta*) salmon, in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). Formal consultation was initiated on December 2, 1999.

Each biological opinion is based on information provided in final biological assessments received on December 2, 1999, in addition to other documents, literature reviews and a site inspection conducted by NMFS during the consultation process. A complete administrative record of this consultation is on file at the Washington Habitat Branch Office.

The U.S. Army Corps of Engineers (ACOE) determined that the proposed projects are likely to adversely affect Puget Sound chinook and Hood Canal summer chum. The NMFS concurs with the ACOE determination that each project is likely to adversely affect these two species of salmon.

The enclosed documents represents NMFS' biological opinions on the effects of the actions on Puget Sound chinook and Hood Canal summer chum salmon, and concludes that implementation of the proposed projects are not likely to jeopardize the continued existence of Puget Sound chinook or Hood Canal summer chum salmon. The incidental take statement in each biological opinion includes reasonable and prudent measures and terms and conditions to minimize take and avoid jeopardy. Also, please note that we have included conservation recommendations in both.

If you have any questions, please contact Thom Hooper of the Washington State Habitat Branch Office at (360) 753-9453.

Sincerely,

for William Stelle, Jr.
Regional Administrator

Enclosure:

cc: Tim Zech, Lakeshore Construction
Christopher Carter
Ernie Ufer

ENDANGERED SPECIES ACT - SECTION 7

BIOLOGICAL OPINION

Ernie Ufer - Pier Ramp and Float
South Shore Hood Canal
WSB-99-518
United States Army Corps of Engineers
1999-1-00474-ATF

Agency: U.S. Army Corps of Engineers

Consultation Conducted By: National Marine Fisheries Service
Northwest Region
Washington State Habitat Branch

Approved ______________________ Date July 27, 2000

William W. Stelle, Jr.
Regional Administrator

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I. BACKGROUND AND DESCRIPTION OF THE PROPOSED PROJECT

A. Background

On December 2, 1999, the National Marine Fisheries Service (NMFS) received a Biological Assessment (BA) from the U.S. Army Corps of Engineers (ACOE). Submission of the BA initiated formal consultation under §7 of the Endangered Species Act (ESA) regarding the proposed retention of eight piles (installed without a permit in spring of 1999) and construction of a pier, ramp, and float over, and on top of, the intertidal marine shore of Hood Canal.

The ACOE issued a Public Notice to Retain (ACOE Reference1999-1-00474-ATF) after it was discovered by the Corps that the contractor for the project began work prior to obtaining a Section 10 permit authorized under the River and Harbors Act of March 3, 1899. The contractor had installed 8 piles and a portion of the pier leading out from the adjacent upland (See Figure 1. in Appendix II).

This Biological Opinion (BO) reflects the results of the consultation process. In addition to the BA, the consultation process has involved communications with a Washington State Department of Fish and Wildlife habitat biologist, and a site visit with the project contractor. The site visit was conducted on May 19, 2000, during a low tide (~ -1.2 ft tide at 1238 hours).

The object of this BO is to determine whether the proposed project is likely to jeopardize either Puget Sound chinook or Hood Canal summer chum. Additionally, the object of this BO is to determine if there will be an adverse modification of their designated critical habitat.

B. Description of the Proposed Action

The ACOE proposes to issue a permit to the homeowner for the construction of a pier, ramp and float. The project location is in Hood Canal on the south shore, approximately 4.5 miles east of Union, Mason County, Washington. The "Action Area" for this project is defined in the BA as South Hood Canal, which includes all of Hood Canal from the Union River to the Skokomish River on the south shore and Rendsland Creek on the north shore. This action area encompasses a holding area for Pacific herring (*Clupea harengus pallasi*), and spawning area for surf smelt (*Hypomesus pretiosus*), sand lance (*Ammodytes hexapterus*) and Pacific herring (WDFW 1992). Effects on these forage fish might affect Hood Canal summer chum and Puget Sound chinook.

The permit (applicant) proposes to retain eight piles and a pier (312 square feet), and install a ramp (160 square feet) down to a float (576 square feet). The maximum width and extension of the structure waterward of the plane of mean high water are eight feet and 100 feet respectively. Construction materials for the structure include eight Chemonite-treated wood piles, pressure-treated wood for framing and decking, aluminum ramp, hot-dipped galvanized hardware, six black plastic float drums, and six Chemonite-treated wooden "grounding" blocks (footprint of 192 square feet). The intent of the grounding blocks is to reduce the areal extent of the portion of the float that would be touching the ground at low water.

The eight piles (four each for the pier and float anchor) were driven and the pier was constructed during a 3-day period, beginning March 8, 1999. This unauthorized work occurred during the work window (March 1 through March 15) established by the Washington State Department of Fish and Wildlife (WDFW) in its Hydraulic Project Approval (HPA). Pile driving occurred during high tide on March 8, 1999. According to the project's agent, the pile driver (37-foot length, 12-ton weight, and 14-inch draw) was floating at all times during use. Once the piles were driven and the structural beams installed, the pile driver was removed from the site.

The remaining portion of the proposed work, including installation of the ramp and float, will require approximately two days to complete. The ramp will be brought to the site over land and attached to the pier. The float will be brought to the site by water during high tide and attached by hoops to the four anchor piles. The agent states that the float is not likely to ground during installation. The applicant proposes to install the ramp and float as soon as possible, but before January 31, 2001.

The width of the pier (eight feet) was chosen to accommodate passing by users and to allow movement of users when chairs are on the pier. Six feet is considered a minimum width for pier stability according to the ACOE. The waterward extension of the pier, ramp and float (100 feet) is the maximum allowed by Mason County for a single-family use. Because of the shallow slope of the tidelands, at a 100-foot extension from the shore, the tide elevation is approximately 0.0 feet. Figure 2 (Appendix II) gives an example of how the float will ground out at low tide. This photograph was taken next door to the subject property.

1. Conservation Measures

The proposed project integrates several conservation measures described in the BA. NMFS has relied on the occurrence of these measures in conducting the analysis presented in this BO.

- Construction work below the ordinary high water line shall not occur when juvenile salmonids are present (March - July).
- Construction work below the ordinary high water line shall not occur when surf smelt (important prey for chinook and chum) are spawning (September 15 to December 31).
- The pier, ramp and float is being placed to ensure protection of eelgrass and herring

spawning habitat.

- The solid decked portions of the structure shall not exceed the following widths: the 40-foot long pier, eight feet; the 40-foot long ramp, four feet; and the 25-foot long "U" shaped float, eight feet.
- No more than 20 percent of the float shall ground at any time. Those portions of the float that will ground shall be constructed to align parallel to the shore and provide a minimum of eight inches clearance between the beach substrate and non-grounding portions of the float.
- Floatation for the float structure shall be fully enclosed and contained to prevent the breakup or loss of the floatation material into the water.
- No creosote will be used.

2. <u>Project Timeline</u>

The remaining work on the project, including installation of the ramp and float will require approximately 2 days of work. The ramp will be brought to the site over land and attached to the pier. The float will be brought to the site by water during high tide and attached by hoops to the four anchor piles. The grounding of the float is not likely to occur during installation.

II. STATUS OF THE SPECIES AND CRITICAL HABITAT

The current range-wide status of the Puget Sound chinook ESU and Hood Canal summer chum ESU is referenced in Table 1, below. Conservation of these species requires improvement in environmental conditions throughout the ESU and action area, including the condition of any designated critical habitat.

Species (Biological Ref.)	**Listing Status Reference**	**Critical Habitat Reference**
Chinook Salmon from Washington, Idaho, Oregon and California, (Meyers, *et al.* 1998)	The Puget Sound chinook ESU is listed as Threatened under the ESA by the NMFS, (64 Fed. Reg.14308, March 24,1999).	Designated Critical Habitat for the Puget Sound chinook ESU, (65 Fed. Reg., 7764, February 16, 2000).
Chum Salmon from Washington, Oregon and California, (Johnson, *et al.* 1997).	The Hood Canal Summer chum ESU is listed as Threatened under the ESA by NMFS, (64 Fed. Reg., 14508, March 25, 1999).	Designated Critical Habitat for the Hood Canal Summer chum ESU, (65 Fed. Reg., 7764, February 16, 2000).

Table 1. References to Federal Register Notices containing additional information concerning listing status, biological information, and critical habitat designations for listed species considered in this biological opinion.

The fjord estuary structure of Hood Canal is particularly important to the linkage of watersheds and subestuary deltas supporting summer chum and chinook as they emigrate from freshwater and migrate seaward. The Canal is 96 km long, averages only 2.5 km wide, and is deep (average greater than 150 m), with glacial sills that restrict circulation (Simenstad, 2000). Because of this structure, except under strong wind forcing, the water column of the Canal is usually highly stratified, with shallow lens of fresh to brackish water at the surface overlaying waters of near-ocean salinity. Due to the sills, water exchange and turnover are limited and residence time long, especially in the southern reaches of the Canal and Dabob Bay, and cold, nutrient-rich upwelling water from the North Pacific intrudes only in late summer (Friebertshauser et. al. 1971; Yoshinaka and Ellifrit 1974; Stickland 1983). Because juvenile salmon tend to migrate in surface waters, and in particularly shallow water as fry yearling in their estuarine life history stage, they are somewhat confined to migratory corridors between subestuary patches that are distributed along the shoreline adjacent to the deeper, open waters of the Canal. Thus the estuarine rearing capacity for summer chum and chinook in the Canal in their early seaward migration is a function of the interlinked system of subestuary deltas and shallow nearshore corridors (Simenstad, et. al., 1999).

The resulting summer chum and chinook salmon migratory corridors between subestuary deltas tend to be composed of a relatively higher energy, narrow intertidal-shallow subtidal beaches of moderate gradient and usually comprised of mixed cobble, gravel and corse sand. Natural beach erosion and shoreline drift maintain these beach processes that continuously supply, transport, and deposit sediments along discrete beach “drift cells” (Simenstad, et. al., 1999)

The most important habitats for juvenile summer chum and chinook salmon within the narrow migratory corridors between subestuary deltas is a typically dense band of the native eelgrass, *Zostera marina* (Simenstad, et. al., 1999).

Chinook and chum salmon early marine life history stage is a critical period. The transition from fresh water to marine habitats is one of the most life-threatening events for anadromous salmonids. Smolting is accompanied by an elevation in metabolic rate (Hoar 1988), which increase energy requirements for juvenile salmon. At the same time, the post smolt must adapt to a new fish community, with possible increases in predation and competition (Levings 1994). Marine conditions during early migration for these salmon are believed to be important to overall growth and survival. Chum and ocean-type chinook salmon fry require nearshore habitats and environmental conditions conducive to rapid growth (Parker 1971; Healey 1979) and immediately begin feeding in the marine environment (Simenstad and Salo 1982, Healey 1982). The abundance of chum fry was shown to be positively correlated with the size of shallow nearshore zones (Bax *et al.,* 1978). Sublittoral eelgrass beds and algal communities have been considered to be the principal habitat utilized by the juvenile chum and chinook salmon in Hood Canal. Upon arrival in the estuary, chum (February - March) and ocean-type chinook (March - May) fry inhabit nearshore areas (Schreiner 1977, Bax 1983, Hoar 1951, Whitmus et. al., 1979, Healey 1982). Chum residence time in the Canal is estimated to be between 2 - 5 weeks. Chinook will stay longer, up to two months. As they enter the estuary from fresh water, Chum and chinook fry have a preferred depth of between 1.5 and 5.0 meters. Chum and chinook prey predominantly on epibenthic (above the bottom substrate) crustaceans, mainly harpacticoid copepods and gammarid amphipods (Bax et al. 1978, Simenstad et al. 1980). However, chum in southern Hood Canal are known to prey almost exclusively on terrestrial insects, likely made available as drift from the Skokomish River (Whitmus 1985). Faster moving fry that have moved further north of the Skokomish delta are found to feed entirely on neritic and epibenthic organisms. Simenstad et al. (1980) show a gradual decrease in the epibenthic fraction of stomach contents as the chum increase in size.

III. EVALUATING PROPOSED ACTIONS

The standards for determining jeopardy are set forth in section 7(a)(2) of the ESA as defined by 50 C.F.R. Part 402 (the consultation regulations). NMFS must determine whether the action is likely to jeopardize the listed species and/or whether the action is likely to destroy or adversely modify critical habitat. This analysis involves the initial steps of (1) defining the biological requirements and current status of the listed species, and (2) evaluating the relevance of the environmental baseline to the species' current status.

Subsequently, NMFS evaluates whether the action is likely to jeopardize the listed species by determining if the species can be expected to survive with an adequate potential for recovery. In making this determination, NMFS must consider the estimated level of mortality attributable to: (1) collective effects of the proposed or continuing action, (2) the environmental baseline, and (3) any cumulative effects. This evaluation must take into account measures for survival and recovery specific to the listed salmon's life stages that occur beyond the action area. If NMFS finds that the action is likely to jeopardize, NMFS must identify reasonable and prudent alternatives for the action.

Furthermore, NMFS evaluates whether the action, directly or indirectly, is likely to destroy or adversely modify the listed species' designated critical habitat. The NMFS must determine whether habitat modifications appreciably diminish the value of critical habitat for both survival and recovery of the listed species. The NMFS identifies those effects of the action that impair the function of any essential element of critical habitat. The NMFS then considers whether such impairment appreciably diminishes the habitat's value for the species' survival and recovery. If NMFS concludes that the action will adversely modify critical habitat it must identify any reasonable and prudent measures available.

Guidance for making determinations on the issue of jeopardy and adverse modification of habitat are contained in *The Habitat Approach, Implementation of Section 7 of the Endangered Species Act for Actions Affecting the Habitat of Pacific Anadromous Salmonids*, August 1999. This document is attached to this BO as Appendix I.

For the proposed action, NMFS' jeopardy analysis considers direct or indirect mortality of fish attributable to the action. NMFS' critical habitat analysis considers the extent to which the proposed action impairs the function of essential habitat elements necessary for feeding, rearing, migration, predator avoidance and refuge under the existing environmental baseline.

A. Biological Requirements

The first step in the methods NMFS uses for applying the ESA section 7(a)(2) to listed salmon is to define the species' biological requirements that are most relevant to each consultation. NMFS also considers the current status of the listed species taking into account population size, trends, distribution and genetic diversity. To assess the current status of the listed species, NMFS starts with the determinations made in its decision to list Puget Sound chinook and Hood Canal summer chum for ESA protection and also considers new data available that is relevant to the determination.

The relevant biological requirements are those necessary for Puget Sound chinook and Hood Canal summer chum to survive and recover to naturally reproducing population levels at which time protection under the ESA would become unnecessary. Adequate population levels must safeguard the genetic diversity of the listed stocks, and enhance their capacity to adapt to various environmental conditions, and allow them to become self-sustaining in the natural environment.

Five general classes of features or characteristics determine the suitability of aquatic habitats for salmonids: flow regime, water quality, habitat structure, food (energy) source, and biotic interactions (Spence, *et al.*, 1996). For this consultation, water quality, habitat structure and biotic interactions are features NMFS believes may be adversely affected as a result of this project.

B. Factors Affecting Puget Sound Chinook and Hood Canal Summer Chum

NMFS has prepared two supporting documents which describe the factors that have led to the decline of Puget Sound chinook, Hood Canal summer chum, and other salmonids. The first is entitled "Factors for Decline: A Supplement to the Notice of Determination for West Coast Steelhead" (NMFS, 1996). That report concluded that all of the factors identified in section 4(a)(1) of the ESA have played a role in the decline of steelhead and other salmonids, including chinook and chum. The report identifies destruction and modification of habitat, overutilization for commercial and recreational purposes, and natural and human-made factors as being the primary reasons for the decline of west coast steelhead, and other salmonids including chinook and chum. The second document is entitled "Factors Contributing to the Decline of West Coast Chinook Salmon: An Addendum to the 1996 West Coast Steelhead Factors for Decline Report" (NMFS, 1998). This report discusses specific factors affecting chinook salmon. In this report, NMFS concludes that all of the factors identified in section 4(a)(1) of the ESA have played a role in the decline of chinook salmon, and other salmonids. The report identifies destruction and modification of habitat, overutilization for recreational purposes, and natural and human-made factors as being the primary reasons for the decline of chinook salmon and other salmon.

The following discussion summarizes findings regarding factors for decline across the range of chinook and chum salmon. While these factors have been treated here in general terms, it is important to underscore that impacts from certain factors are more acute for specific Evolutionary Significant Units (ESUs). For example, impacts from hydro-power development are more pervasive for ESUs in the Columbia River Basin than for the Puget Sound chinook or Hood Canal summer chum ESUs.

1. <u>The Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range</u>

Chinook and chum salmon in Puget Sound and Hood Canal have experienced declines in abundance in the past several decades as a result of loss, damage or change to their natural environment (Johnson et. al., 1997, NMFS 1998).

2. <u>Overutilization for Commercial, Recreational, Scientific or Educational Purposes</u>

Historically, chinook and chum salmon were abundant in many western coastal and interior waters of the United States. Chinook and chum have supported, and still support important tribal, commercial and recreational fisheries throughout their range, contributing millions of dollars to numerous local economies, as well as providing important cultural and subsistence needs for Native Americans. Over-fishing in the early days of European settlement led to the depletion of many salmon stocks even before extensive habitat degradation. However, following the degradation of many west coast aquatic and riparian ecosystems, exploitation rates were higher than many chinook and chum populations could sustain. Therefore, harvest may have contributed to the further decline of some populations (Johnson et. al., 1997, NMFS 1998).

3. <u>Disease or Predation</u>

Introductions of non-native species and habitat modifications have resulted in increased predator populations in numerous rivers and lakes. Predation of juvenile chinook and chum in marine settings due to loss of nearshore shallow habitat and other shoreline alterations along with predation of adults by marine mammals is also of concern in areas experiencing dwindling numbers of chinook and chum (Johnson et. al., 1997, NMFS 1998).

The proposed action would have some level of effect with the first category above. The extent and duration of such effects and a conclusion regarding the upshot of those effects on Puget Sound chinook and Hood Canal summer chum salmon are provided below.

C. Environmental Baseline

Within the action area, the biological requirements for the Puget Sound chinook and Hood Canal summer chum are not being met under the existing environmental baseline. The summer chum salmon recovery plan (Ames et. al. eds., 2000) rates cumulative impacts to Hood Canal habitat as a major factor for decline of summer chum. Any further degradation of existing conditions would probably increase the risks to listed salmon under the existing baseline conditions.

The action area encompasses the south shore of Hood Canal (Skokomish River to the Union River) is approximately 17 miles long. The proposed project discussed in this BO is located near Belfair, Washington. The Union River, and Tahuya River are nearby systems that produce both chinook and summer chum. The Skokomish River is also nearby, and while it does not support summer chum, it is a major chinook system.

1. Skokomish River

In the Skokomish River system, chinook spawning occurs up to river mile 5.0 in the South Fork, and is limited to below river mile 13.0 in the North Fork - because the Cushman Dam blocks further upstream access. Intensive logging activity has compromised the quality of chinook spawning habitat in the South Fork.

2. Union and Tahuya Rivers

The Union and Tahuya rivers both have low numbers of spawning chinook. Chinook spawning in the Union River is limited to within the first five river miles. Spawning in the Tahuya river can occur slightly above river mile 7.

The Union River summer chum are identified as a separate stock from other Hood Canal summer chum. The spawning of this stock takes place earlier than in other systems. The production of the Union River summer chum is dependent on wild spawning. No hatchery releases of summer chum into the Hood Canal have been made. Spawning in the Union River is within the first five river miles but predominately in the lower mile of the watershed. In contrast to other summer chum production streams within the region, the Union River summer chum escapement has been stable in abundance in recent years relative to historical (Ames et. al., 2000). In the 1970s, the Union River summer chum were less abundant that in the Tahuya, increasing in abundance as the Tahuya declined. It is unclear why the Union run increased during the 1980s and 1990s while other stocks experienced significant declines, several becoming extinct (Ames et. al., 2000). Spawning in the Tahuya River is within the first 10 river miles.

3. Shoreline

Hood Canal straddles a sharp break in landform, between the Olympic Mountains to the west and the Willamette-Puget Sound Lowland to the east. The Olympic Mountains strongly influence seasonal precipitation and riverflow on the western region, with up to 2.5 m mean annual runoff within the watersheds draining into the western side of Hood Canal, 1.5-2.0 m on the southern edge of the Olympics, and approximately 1 m on the lowlands draining into the eastern side.

Much of the south shore of the Canal is documented surfsmelt (*Hypomesus pretosus pretosus*) spawning grounds in the upper reaches of the intertidal zone (WDFW 1992). In the lower intertidal and shallow subtidal zones along this shore, where kelp, algae, or eelgrass are present, herring (*Clupea harengus pallasi*) spawning occurs. In much of the smelt spawning areas, sandlance (*Ammodytes hexapterus*) also have been found to spawn. In southern Hood Canal herring spawn from mid-January to the end of February. Surf smelt spawn from the middle of September to the end of February. These species of fish are collectively referred to as "baitfish," or "forage fish." These fish are small, pelagic schooling fish which are important as forage for predatory fish (such as adult chinook, chum, and coho salmon), birds and mammals. They provide an important link in the food chain between zooplankton and piscivorus animals.

A concerning element of the environmental baseline is the pile driving which has already taken place. The pile driving was conducted March 1999, during a time when summer chum fry were likely to have been present in the nearshore area. Depending upon surface sediments and underlying strata of sediments, pile driving can affect water quality. Fine silts can spread vertically and horizontally in the water column over a broad area around the pile driving activity. In addition to potential adverse affects on water quality, percussion from the pile driving activity can affect juvenile salmon behavior. This can range from relatively benign responses such as holding migration, or "stacking," in shallow water, to potentially adverse behavior such as moving into deeper water where predation could occur.

Increased sedimentation from pile driving would have the same effect. Fish will actively avoid these areas in the marine shore if they can. The result is moving into deeper water, or "stacking" outside of the sediment plume. Fish caught inside a sediment plume may or may not be adversely affected, depending on a number of variables. These variables include, sediment density in the water column, sediment composition (percent fines/silts), sediment toxicity, and overall fitness of the juvenile fish. The pile driving occurred at high water. Juvenile chum migrating through would have been against the vertical wall of the existing concrete bulkhead (Figure 3 - Appendix II). The presence of the bulkhead gives no shallow water refuge for juvenile chum and chinook migrating past this section of the beach at high water. Mean higher high water (MHHW) was estimated to be 3.75 feet up this bulkhead. Spring higher high tides during salmon out-migration would force fish into water over 5 feet deep. Potential effects from pile driving during this time exacerbates this adverse baseline condition.

The south shore of Hood Canal (half of the action area) has been carved up into over 900 separate properties. State highway 106 parallels the shore within 150 feet of the ordinary high water (OHW) mark of the tides. It is by this highway that property owners access their properties. In many cases along the shore, buildable home sites have been created with the aid of protective bulkheads installed below the OHW. This has lead to the loss of critical habitat in the form of shallow-water refugia, feeding, and migration habitat for juvenile chinook and chum salmon. The creation of upland sites in this fashion, or the protection of upland sites by bulkheads, have also had significant cumulative impacts on surf smelt and sandlance spawning habitats (WDFW 1992). As noted above, these forage fish are essential secondary producers and are prey for adult chinook and chum salmon.

Much of the south shore of Hood Canal is bulkheaded. Approximately 60% of the smelt spawning grounds in Hood Canal have been destroyed by bulkheads placed in the upper intertidal zone (Pentilla, 1988). Over 17 percent of the existing homes on the south shore of Hood Canal have a pier, ramp, and float over the beach in front of them. Studies by WDFW (1990) have shown that structures over the water effectively shade out marine algae and eelgrass. The Biological Evaluation submitted by the ACOE states there are 162 floats or docks on the south shore of Hood Canal.

Although individual shoreline structures might not impose significant impacts to salmon, the cumulative, contiguous shoreline modifications might have contributed to the present decline of salmon and inhibit the success of future salmon recovery actions (Simenstad, et. al., 1999). As noted above, in front of many of the 900 properties there currently exists a bulkhead and/or a pier, ramp and float structure similar or identical to the proposed project considered by this BO. In one 6.2 mile stretch of beach on the south shore, between Twanoh State Park and Calm Cove, there are currently 88 pier, ramp and float combinations. Cumulatively, these docks, have shaded approximately 2.2 acres of intertidal habitat.[1] The ground beneath these docks will no longer support photosynthesis, hence eelgrass or algae growth.

While as much as 2.2 acres of shallow intertidal habitat has been effectively shaded out from primary production, the cumulative adverse effect on chinook or chum salmon have not been measured. NMFS has calculated the effects on designated critical habitat. Excluding the Skokomish and Union River deltas, it is estimated that there are between 180 and 200 acres of intertidal habitat on the south shore of the Canal. When measured against this figure, the acreage affected by shading represents between 1.1 and 1.2 percent of the total.

Tides along the Pacific coast of North America are of the mixed simidiurnal type; that is, there is a pronounced difference between the levels to which two successive low tides fall, and a lesser but still apparent, difference between the levels reached by two successive high tides. The two lows each day are known as the higher and lower low waters; the two highs are the higher and lower high waters. During the course of a lunar month, there are highest and lowest spring tides, highest and lowest neap tides, and a mean or average tide. During the month there will be a highest or extreme high water

[1] If the areal extent of the proposed float is an average-sized float (600 square feet), then approximately 97,200 square feet (2.2 acres) of intertidal beach has been shaded and rendered unproductive ground for eelgrass, or algae production.

spring tide (EHWS), the highest level on the shore that the tide reaches in that month, and a lowest or extreme low water spring tide (ELWS), when the tide ebbs to its lowest level on the shore. Organisms living at the EHWS level on the shore will be wetted only once during the month, and those at the ELWS level will be exposed to air only once during the month. Between these extremes exists a continuum, from mostly air-emersed to mostly water-submersed. It is within these limits that shore organisms sort themselves out into horizontal bands, or zones, with often well-defined upper limits of distribution, and with less clearly defined lower limits of distribution.

Due to this intertidal zonation of organisms attributable to the tides, the biological productivity is not the same across the whole intertidal profile of the beach (Carefoot, 1977). The biological productivity specific to the intertidal "zone" affected by the 2.2 acres described above is more robust than higher tidal elevations. For the purpose of this analysis, it is estimated that the shading from the floats is between plus one foot mean lower low water (MLLW), or, +1.0 feet tidal elevation to -2.0 feet below MLLW. This zone is wetted more than the upper intertidal zones, is well within the photic zone, and is biologically much more productive than zones higher in the intertidal. This is illustrated in Figure 4 of Appendix B where the green band of algae can be followed along the beach from the foreground out to the horizon in this photograph. When considering this narrow band of biological productivity, the 2.2 acres of degraded habitat becomes more pronounced. The percent of acreage affected on the south shore of Hood Canal within this zone on the beach is between 4.3 and 4.8 percent.

IV. ANALYSIS OF EFFECTS

A. Effects of the Proposed Action

This effects analysis follows the process described in *Making ESA Determinations of Effect for Individual or Grouped Actions at the Watershed Scale* (NMFS, 1996). That process uses a matrix of habitat pathways and indicators (MPI) as a framework to describe the existing environmental baseline and derive an evaluation of effects. Those effects are expressed in terms of whether the activities under the proposed action would restore, maintain, or degrade the aquatic habitat factors that comprise the MPI. The MPI's aquatic habitat elements include water quality, habitat access, habitat structural elements, dynamics of flow and hydrology, and overall watershed conditions. The indicators assessed in the MPI are constituent elements of the pathways. For example, indicators for the water quality pathway include temperature, sediment/turbidity, and chemical concentrations.

Analytically, this section is organized into direct and indirect effects. The description of direct effects include the adverse effects from construction, and beneficial effects of elements of project design, construction staging, and construction methods that were incorporated into the project to address some adverse direct effects. The description of indirect effects mostly addresses the increased amounts of shading over the substrate, grounding of the float, and water quality issues.

Bulkheads along a beach contribute to increased wave energy, reduced sediment inputs, and increased substrate size. The presence of bulkheads and piers reduce or eliminate the potential for overhanging vegetation. Loss of vegetation reduces inputs of terrestrial insects, detritus and shade. Studies by the Washington State Department of Fisheries (WDFW, 1988) have shown that, as substrate size increases, the epibenthic prey production decreases.

1. Direct Effects

Direct effects are immediate effects of the project on the species or its habitat. Adverse effects to chinook and summer chum, and their habitat could ordinarily occur during construction of the pier, ramp and float facility. However, the pile driving is already complete. Since the float is not going to ground during its installation, direct adverse effects are not expected.

2. Indirect Effects

The pier, ramp, and float may have indirect adverse effects on salmon migration. Simenstad et. al., assessed over 60 direct sources of information and found evidence that juvenile salmon react to shadows and other artifacts in the shoreline environment imposed by shoreline structures. Docks present sharp underwater light contrasts by casting shade under ambient daylight conditions, and they also present sharp underwater light contrasts by casting artificial light under ambient nighttime conditions. The studies summarized in Simenstad, et. al., repeatedly verify that changes in the underwater light environment affect juvenile salmonid physiology and behavior. Laboratory experiments have shown that many behavioral changes (minimum prey capture, first feeding, school dispersion) correspond to a light intensity threshold of 10^{-4} foot candles (f-c), while maximum feeding occurs at light intensities of between 10^{-1} and 1 f-c (Simenstad, *et. al.*, 1999).

These changes may affect fish migration behavior and place them at increased mortality risk. In a number of studies throughout Puget Sound, juvenile salmon have been observed to alter their behavior upon encountering docks during their nearshore migration. These observations, and those of studies which salmonids were guided through dangerous structures (i.e., dam turbines, locks) with artificial lighting, imply that these fish may be exposed to increased sublethal stresses and increased risk of mortality as a consequence of the following (Simenstad, et. al., 1999):

1. Delays in their migration due to disorientation caused by lighting changes.
2. Loss of schooling refugia due to fish school dispersal under light limitation.
3. A change in migratory route into deeper waters, without refugia, to avoid the light change.

Longer term effects from the project will result from the shading and grounding of the float section and possible localized water quality effects around the float and piles. The float will add to the approximately 2.2 acres of shading effects from the existing floats on the south shore. The proposed float is 576 square feet. The exact location of the proposed float is easily determined by the presence of the anchor piles. Figure 4 (Appendix II) shows the substrate that will be affected. This section of the south beach was seeded with oysters in recent years and is the dominant substrate that would be affected. The seeding of oysters was conducted by WDFW (Small, 2000). Shading from the float will preclude the continued existence of algae below. Grounding will adversely affect the oysters. The oysters provide additional surface area on the beach substrate and provide habitat for epibenthic invertebrates upon which juvenile chum and chinook salmon prey.

While oysters are a dominant component of the benthic community, their presence has not precluded the growth of aquatic vegetation. Algae was also a noticeable part of the benthic community and whose growth and future survival will be affected. These algae include *Ulva*, *Enteromorpha*, *Monostroma and Gracilaria*. While *Gracilaria* is known to be used by herring for spawning along this south shore, it has been determined by NMFS and WDFW that herring do not utilize this particular site to spawn. Studies by WDFW have shown that the edge of the zone of shading beneath the float structure will sharply define eelgrass and algal growth (Pentilla 1989).

Light energy drives plant photosynthesis processes. These processes are modified by the synergistic effects of nutrient concentrations, temperature, salinity, and wave action that control the quality and quantity of available light, as well as the plants' physical environment. Modification to these variables beneath an over-hanging structure, although relatively localized, influence the rate of photosynthesis, plant distribution, and survival of specific plant species that directly or indirectly support juvenile salmonid prey resource composition and production.

Juvenile salmon encounter limited prey resources under shoreline structures when important habitats such as eelgrass (*Zostera marina*) and algae are disturbed. Epibenthic crustaceans are the prey resources of most concern because they are usually associated with nearshore plants that are affected by over-water structures.

The eight piles, and six grounding blocks (under the float) have been treated with ammoniacal copper zinc arsenate (ACZA). In the freshwater environment, copper is the main metal of concern from this treatment because it is the most acutely toxic. Also, in freshwater, copper leaches the most, followed by arsenic and chromium (NMFS, 1998). It is not known however, the fate of these heavy metals in the marine environment. Due to the pH of marine water, significant leaching of these metals is not expected. However, some leachate of metals from the treated wood will undoubtably occur on exposed parts of the piling and other treated woods when it rains, and localized, potentially adverse water quality effects may result.

B. Effects on Critical Habitat

NMFS designates critical habitat for a listed species based on physical and biological features that are essential to that species. In designating critical habitat, NMFS considers the following requirements of the species: (1) Space for individual and population growth, and for normal behavior; (2) food, water, air, light, minerals, or other nutritional or physiological requirements; (3) cover or shelter; (4) sites for breeding, reproduction, or rearing of offspring; and, generally, (5) habitats that are protected from disturbance or are representative of the historical geographical and ecological distributions of the species. In addition to these factors, NMFS also focuses on the known physical and biological features within the designated area that are essential to the conservation of the species and that may require special management considerations or protection. These essential features may include, but are not limited to, spawning sites, refuge and migration corridors, food resources, water quality and quantity, and riparian vegetation.

Critical habitat for the Puget Sound chinook includes all marine estuarine and river reaches accessible to listed chinook salmon in Puget Sound (65 Fed. Reg. 7764; February 16, 2000).

Critical habitat for Hood Canal summer chum includes all river reaches accessible to listed chum salmon, including estuarine areas and tributaries, draining into Hood Canal as well as Olympic Peninsula rivers between and including Hood Canal and Dungeness Bay, Washington (65 Fed. Reg. 7764; February 16, 2000).

NMFS expects that the effects from this proposal will have a slight incremental adverse impact on designated critical habitat. An additional 600 square feet of nearshore intertidal habitat will be shaded and within this area, primary productivity (photosynthesis) will cease. This loss of production will be minor, yet will contribute to the cumulative effect on epibenthic invertebrate production in Hood Canal. As stated above, epibenthic invertebrates are essential prey organisms for juvenile chinook and chum salmon in the marine environment.

C. Cumulative Effects

Cumulative effects are defined in 50 C.F.R. 402.02 as "those effects of future State or private activities, not involving Federal Activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation." For the purposes of this analysis, cumulative effects for the general action area are considered. Future Federal actions, such as issuance of ACOE permits for other in-water construction projects will be reviewed through separate section 7 consultation processes and are therefore not considered in this analysis.

The south shore of Hood Canal is primarily residential. Much of this shoreline has been developed. However, there are still many properties which have not yet been developed and it is reasonable to expect that further development will occur. Such projects would involve clearing, grading, and site preparation activities to construct single-family dwellings. This will result in further reduction of shoreline vegetation. As shoreline development continues, it is reasonable to expect that this would cause potential adverse affects. The loss of over-hanging vegetation above the upper intertidal zone, in particular, could result in adverse modifications to smelt and sandlance spawning grounds. Incubating forage fish eggs need shade to protect them from dessication (WDFW 1992). Loss of shoreline vegetation would also lead to a reduction in detrital inputs and terrestrial insects. Detrital inputs are important in providing substrates for microbial decay which leads to the production of epibenthic prey organisms for juvenile salmon. Reductions in terrestrial insects is a direct loss to the salmon prey base. Loss of shoreline vegetation can also lead to bank destabilization and the need for a protective bulkhead. Additional bulkheads could result in the loss of more smelt and sandlance spawning habitats. In addition, continued development of the shore can alter groundwater seepage onto the beach. Freshwater inputs to the intertidal shore, where they naturally occur, are critical to the properly functioning biological condition of that shore.

The loss of aquatic plant production has other cumulative effects on the nearshore. Organic carbon is significant to primary and secondary producers in the marine environment. Organic carbon comes in the form of decaying plants. Plants can be of terrestrial or aquatic origin. With the uplands along the south shore of Hood Canal altered from historic riparian vegetation to mostly bulkheads and/or residences, the most significant inputs of organic carbon remaining are from the larger rivers and from aquatic plant production. Decaying aquatic plants, or detritus, is a significant source of food energy via microorganisms (bacteria, fungi, viruses) for many epibenthic invertebrates, including those important in the diet of juvenile salmonids. The proposed project will have an immeasurable, yet incremental affect on organic carbon production. In turn, this loss of production will incrementally affect detrital inputs, microbial decay, and epibenthic prey production.

V. CONCLUSION

Despite adding to cumulative effects on already degraded critical habitat, NMFS has determined, based on the information available, that the effects of the proposed action would not likely jeopardize the continued existence of Puget Sound chinook or Hood Canal summer chum salmon. NMFS has also determined there will not be an adverse modification of their designated critical habitat, primarily because eelgrass and forage fish spawning will not be displaced. NMFS used best available scientific and commercial data in this analysis. The analysis was completed by comparing the expected effects of the proposed action on elements of the species' biological requirements, together with cumulative effects, to the environmental baseline. NMFS applied applicable portions of the watershed-based evaluation methodology (NMFS 1996) to the proposed action and found that it would cause short-term and long-term adverse degradation of anadromous salmonid habitat due to habitat loss. Juvenile salmon may react to the physical presence of the pier, ramp and float structure by altering migration and behavioral patterns to an unknown degree.

Changes to designated critical habitat, and potential reductions in salmonid fitness (or survival) may occur later in time as a result of indirect and cumulative effects. This effect would result from reductions in carrying capacity. In making this determination, NMFS considered the following sequence: increased shading, loss of primary productivity, reduction in detrital inputs, microbial decay, and finally, epibenthic invertebrate (salmonid prey-base) production. Unfortunately, studies have not been conducted along this shore to determine the significance of this effect.

NMFS has determined that adverse affects to forage fish spawning habitat are not likely. Site inspections by NMFS in May 2000, found the immediate habitat area unsupportive for smelt, sandlance or herring spawning.

VI. REINITIATION OF CONSULTATION

Consultation must be reinitiated if: the amount or extent of taking specified in the Incidental Take Statement is exceeded, or is expected to be exceeded; new information reveals effects of the action may affect listed species in a way not previously considered; the action is modified in a way that causes an effect on listed species that was not previously considered; or, a new species is listed or critical habitat is designated that may be affected by the action (50 C.F.R. 402.16).

VII. INCIDENTAL TAKE STATEMENT

Sections 4 (d) and 9 of the ESA prohibit any taking (harass, harm pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct) of listed species without a specific permit or exemption. Harm is further defined by NMFS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, and sheltering (50 C.F.R. Part 222; November 8, 1999). Harass is defined as actions that create the likelihood of injuring listed species to such an extent as to significantly alter normal behavior patterns which include, but are not limited to, breeding, feeding, and sheltering. Incidental take is take of liste animal species that results from, but is not the purpose of, the Federal agency or the applicant carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action is not considered prohibited taking provide that such taking is in compliance with the terms and conditions of this incidental take statement.

An incidental take statement specifies the impact of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize impacts and sets forth terms and conditions with which the action agency must comply in order to implement the reasonable and prudent measures.

A. Amount or Extent of the Take

The NMFS anticipates that the incidental take of Puget Sound chinook and Hood Canal summer chum salmon could result from project activities as described in the BA and BO. Despite the use of the best scientific and commercial data available, NMFS cannot estimate a specific amount of incidental take of individual fish. However, the mechanisms of expected effects are explained below. The extent to which these mechanisms may result in effects on salmon or salmon habitat can be described qualitatively, enabling reinitiation of consultation if such effects are exceeded during the project.

Placement of the ramp and attaching the float to the anchor piles will not cause additional harassment because there will be no in-water construction, and this phase of the construction activity will be conducted when migrating and feeding juvenile salmonids are not expected to be present.

NMFS believes three mechanisms of take may occur. The first mechanism of take could occur as a result of the increased shading below the float and the subsequent loss of primary and secondary productivity leading to a loss in epibenthic prey for juvenile chinook and chum salmon. While on a cumulative basis, this shading and loss of productivity could and will have lasting and local adverse affects, NMFS does not believe that this singular dock and associated indirect and cumulative affects will jeopardize the continued existence of Puget Sound chinook and Hood Canal summer chum salmon.

A second form of take may occur by altering the shoreline migration of juvenile salmon. Because juvenile summer chum and ocean-type chinook salmon tend to migrate in shallow-water habitats along estuarine and marine shorelines, over-water structures may present physical and behavioral barriers. This can cause these fish to divert into deeper water, thereby increasing their exposure to predators. Forcing juvenile salmon into deeper water might further affect salmon survival by decreasing their growth because of limited availability of the appropriate prey resources. The cumulative impact of these structures (now 163 on the south shore) could be an overall reduction in survival rate as juveniles traverse through Hood Canal (Simenstad, et. al., 1999).

Finally, localized water quality impacts from the ACZA-treated piles and grounding blocks could cause harm to juvenile salmon. This effect could be from direct exposure, or indirectly by reducing prey abundance. NMFS recognizes that these effects will be difficult to quantify, and in the marine environment, potential adverse affects could be short-lived.

B. Reasonable and Prudent Measures

The NMFS believes that the following reasonable and prudent measures are necessary and appropriate to minimizing take of the Puget Sound chinook and Hood Canal summer chum salmon.

1. The ACOE shall require the applicant to rake the oysters out of the 600 square foot area expected to be impacted by the grounding of the float (not just beneath the grounding blocks).

2. The management and construction provisions of the Hydrualic Project Approval are incorporated by reference.

C. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the applicant must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1. As per #2 above, the oysters shall be hand picked or carefully raked aside. These oysters shall be kept at the same tidal elevation and not placed on top of:

   (a) any existing oysters, or
   (b) other macro-invertebrates, or
   (c) macro-algae, or
   (d) eelgrass.

   This will preserve the beneficial effects they provide the nearshore ecosystem, including effects on salmonid production.

2. The terms and conditions of the Hydraulic Project Approval, will be fully implemented.

VIII. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or designated critical habitat, to help implement recovery plans, or to develop additional information.

At low tide the float is designed to rest on six grounding blocks which have a footprint of 192 square feet. However, in soft ground, such as the case on this beach, the grounding blocks will sink, and the 600 square-foot float will ground out. This will occur on nearly a daily, and sometimes, twice daily basis. This smothering effect may render the benthic habitat less productive biologically over a fairly short period of time. This impact will contribute to the baseline condition established by the previously installed structures of this kind and the other shoreline modifications.

This affect can be mitigated. Stop-collars or similarly engineered devices could be attached to the anchor piles to keep the float slightly elevated above the ground during low tides. As the tide recedes, the float would come to rest on these stopping devices rather than onto the ground. The ACOE should consider requiring apparatus of this nature in permitting structures of this kind.

NMFS strongly recommends that all in-water construction activities should not be allowed from February 15 through July 15 of any year for the protection of water quality and migrating juvenile salmonids.

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Appendix I

The Habitat Approach, Implementation of Section 7 of the ESA for Actions Affecting The Habitat of Pacific Anadromous Salmonids

August 1999

ENDANGERED SPECIES ACT - SECTION 7

BIOLOGICAL OPINION

Christopher Carter - Pier Ramp and Float
South Shore Hood Canal
WSB-99-519
United States Army Corps of Engineers
1999-1-00482-ATF

Agency: U.S. Army Corps of Engineers

Consultation Conducted By: National Marine Fisheries Service
Northwest Region
Washington State Habitat Branch

Approved ____________________ Date July 27, 2000
William W. Stelle, Jr.
Regional Administrator

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I. BACKGROUND AND DESCRIPTION OF THE PROPOSED PROJECT

A. Background

On December 2, 1999, the National Marine Fisheries Service (NMFS) received a Biological Assessment (BA) from the U.S. Army Corps of Engineers (ACOE). Submission of the BA initiated formal consultation under §7 of the Endangered Species Act (ESA) regarding the proposed retention of eight piles (installed without a permit in spring of 1999) and construction of a pier, ramp, and float over, and on top of, the intertidal marine shore of Hood Canal.

The ACOE issued a Public Notice to Retain (ACOE Reference1999-1-00482-ATF) after it was discovered by the Corps that the contractor for the project began work prior to obtaining a Section 10 permit authorized under the River and Harbors Act of March 3, 1899. The contractor had installed 8 piles and a portion of the pier leading out from the adjacent upland (See Figure 1. in Appendix II).

This Biological Opinion (BO) reflects the results of the consultation process. In addition to the BA, the consultation process has involved communications with a Washington State Department of Fish and Wildlife habitat biologist, and a site visit with the project contractor. The site visit was conducted on May 19, 2000, during a low tide (~ -1.2 ft tide at 1245 hours).

The object of this BO is to determine whether the proposed project is likely to jeopardize either Puget Sound chinook or Hood Canal summer chum. Additionally, the object of this BO is to determine if there will be an adverse modification of their designated critical habitat.

B. Description of the Proposed Action

The ACOE proposes to issue a permit to the homeowner for the construction of a pier, ramp and float. The project location is in Hood Canal on the south shore, approximately 1.75 miles west of Belfair, Mason County, Washington. The "Action Area" for this project is defined in the BA as South Hood Canal, which includes all of Hood Canal from the Union River to the Skokomish River on the south shore and Rendsland Creek on the north shore. This action area encompasses a holding area for Pacific herring (*Clupea harengus pallasi*), and spawning area for surf smelt (*Hypomesus pretiosus*), sand lance (*Ammodytes hexapterus*) and Pacific herring (WDFW 1992). Effects on these forage fish might affect Hood Canal summer chum and Puget Sound chinook.

The permit (applicant) proposes to retain eight piles and a pier (320 square feet), and install a ramp (160 square feet) down to a float (600 square feet). The maximum width and extension of the structure waterward of the plane of mean high water are eight feet and 100 feet respectively. Construction materials for the structure include eight Chemonite-treated wood piles, pressure-treated wood for framing and decking, aluminum ramp, hot-dipped galvanized hardware, six black plastic float drums, and six Chemonite-treated wooden “grounding” blocks (footprint of 192 square feet). The intent of the grounding blocks is to reduce the areal extent of the portion of the float that would be touching the ground at low water.

The eight piles (four each for the pier and float anchor) were driven and the pier was constructed during a 3-day period, beginning March 8, 1999. This unauthorized work occurred during the work window (March 1 through March 15) established by the Washington State Department of Fish and Wildlife (WDFW) in its Hydraulic Project Approval (HPA). Pile driving occurred during high tide on March 8, 1999. According to the project’s agent, the pile driver (37-foot length, 12-ton weight, and 14-inch draw) was floating at all times during use. Once the piles were driven and the structural beams installed, the pile driver was removed from the site.

The remaining portion of the proposed work, including installation of the ramp and float, will require approximately two days to complete. The ramp will be brought to the site over land and attached to the pier. The float will be brought to the site by water during high tide and attached by hoops to the four anchor piles. The agent states that the float is not likely to ground during installation. The applicant proposes to install the ramp and float as soon as possible, but before January 31, 2001.

The width of the pier (eight feet) was chosen to accommodate passing by users and to allow movement of users when chairs are on the pier. Six feet is considered a minimum width for pier stability according to the ACOE. The waterward extension of the pier, ramp and float (100 feet) is the maximum allowed by Mason County for a single-family use. Because of the shallow slope of the tidelands, at a 100-foot extension from the shore, the tide elevation is approximately 0.0 feet. Figure 2 (Appendix II) gives an example of how the float will ground out at low tide. This photograph was taken a few miles west of the subject property.

1. Conservation Measures

The proposed project integrates several conservation measures described in the BA. NMFS has relied on the occurrence of these measures in conducting the analysis presented in this BO.

- Construction work below the ordinary high water line shall not occur when juvenile salmonids are present (March - July).
- Construction work below the ordinary high water line shall not occur when surf smelt (important prey for chinook and chum) are spawning (September 15 to December 31).
- The pier, ramp and float is being placed to ensure protection of eelgrass and herring spawning habitat.
- The solid decked portions of the structure shall not exceed the following widths: the 40-foot long pier, eight feet; the 40-foot long ramp, four feet; and the 25-foot long “U” shaped float, eight feet.
- No more than 20 percent of the float shall ground at any time. Those portions of the

float that will ground shall be constructed to align parallel to the shore and provide a minimum of eight inches clearance between the beach substrate and non-grounding portions of the float.

- Floatation for the float structure shall be fully enclosed and contained to prevent the breakup or loss of the floatation material into the water.
- No creosote will be used.

2. Project Timeline

The remaining work on the project, including installation of the ramp and float will require approximately 2 days of work. The ramp will be brought to the site over land and attached to the pier. The float will be brought to the site by water during high tide and attached by hoops to the four anchor piles. The grounding of the float is not likely to occur during installation.

II. STATUS OF THE SPECIES AND CRITICAL HABITAT

The current range-wide status of the Puget Sound chinook ESU and Hood Canal summer chum ESU is referenced in Table 1, below. Conservation of these species requires improvement in environmental conditions throughout the ESU and action area, including the condition of any designated critical habitat.

Species (Biological Ref.)	**Listing Status Reference**	**Critical Habitat Reference**
Chinook Salmon from Washington, Idaho, Oregon and California, (Meyers, *et al*. 1998)	The Puget Sound chinook ESU is listed as Threatened under the ESA by the NMFS, (64 Fed. Reg.14308, March 24,1999).	Designated Critical Habitat for the Puget Sound chinook ESU, (65 Fed. Reg., 7764, February 16, 2000).
Chum Salmon from Washington, Oregon and California, (Johnson, *et al*. 1997).	The Hood Canal Summer chum ESU is listed as Threatened under the ESA by NMFS, (64 Fed. Reg., 14508, March 25, 1999).	Designated Critical Habitat for the Hood Canal Summer chum ESU, (65 Fed. Reg., 7764, February 16, 2000).

Table 1. References to Federal Register Notices containing additional information concerning listing status, biological information, and critical habitat designations for listed species considered in this biological opinion.

The fjord estuary structure of Hood Canal is particularly important to the linkage of watersheds and subestuary deltas supporting summer chum and chinook as they emigrate from freshwater and migrate seaward. The Canal is 96 km long, averages only 2.5 km wide, and is deep (average greater than 150 m), with glacial sills that restrict circulation (Simenstad, 2000). Because of this structure, except under strong wind forcing, the water column of the Canal is usually highly stratified, with shallow lens of fresh to brackish water at the surface overlaying waters of near-ocean salinity. Due to the sills, water exchange and turnover are limited and residence time long, especially in the southern reaches of the Canal and Dabob Bay, and cold, nutrient-rich upwelling water from the North Pacific intrudes only in late summer (Friebertshauser et. al. 1971; Yoshinaka and Ellifrit 1974; Stickland 1983). Because juvenile salmon tend to migrate in surface waters, and in particularly shallow water as fry yearling in their estuarine life history stage, they are somewhat confined to migratory corridors between subestuary patches that are distributed along the shoreline adjacent to the deeper, open waters of the Canal. Thus the estuarine rearing capacity for summer chum and chinook in the Canal in their early seaward migration is a function of the interlinked system of subestuary deltas and shallow nearshore corridors (Simenstad, et. al., 1999).

The resulting summer chum and chinook salmon migratory corridors between subestuary deltas tend to be composed of a relatively higher energy, narrow intertidal-shallow subtidal beaches of moderate gradient and usually comprised of mixed cobble, gravel and corse sand. Natural beach erosion and shoreline drift maintain these beach processes that continuously supply, transport, and deposit sediments along discrete beach “drift cells” (Simenstad, et. al., 1999)

The most important habitats for juvenile summer chum and chinook salmon within the narrow migratory corridors between subestuary deltas is a typically dense band of the native eelgrass, *Zostera marina* (Simenstad, et. al., 1999).

Chinook and chum salmon early marine life history stage is a critical period. The transition from fresh water to marine habitats is one of the most life-threatening events for anadromous salmonids. Smolting is accompanied by an elevation in metabolic rate (Hoar 1988), which increase energy requirements for juvenile salmon. At the same time, the post smolt must adapt to a new fish community, with possible increases in predation and competition (Levings 1994). Marine conditions during early migration for these salmon are believed to be important to overall growth and survival. Chum and ocean-type chinook salmon fry require nearshore habitats and environmental conditions conducive to rapid growth (Parker 1971; Healey 1979) and immediately begin feeding in the marine environment (Simenstad and Salo 1982, Healey 1982). The abundance of chum fry was shown to be positively correlated with the size of shallow nearshore zones (Bax *et al*., 1978). Sublittoral eelgrass beds and algal communities have been considered to be the principal habitat utilized by the juvenile chum and chinook salmon in Hood Canal. Upon arrival in the estuary, chum (February - March) and ocean-type chinook (March - May) fry inhabit nearshore areas (Schreiner 1977, Bax 1983, Hoar 1951, Whitmus et. al., 1979, Healey 1982). Chum residence time in the Canal is estimated to be between 2 - 5 weeks. Chinook will stay longer, up to two months. As they enter the estuary from fresh water, Chum and chinook fry have a preferred depth of between 1.5 and 5.0 meters. Chum and chinook prey predominantly on epibenthic (above the bottom substrate) crustaceans, mainly harpacticoid copepods and gammarid amphipods (Bax et al. 1978, Simenstad et al. 1980). However, chum in southern Hood Canal are known to prey almost exclusively on terrestrial insects, likely made available as drift from the Skokomish River (Whitmus 1985). Faster moving fry that have moved further north of the Skokomish delta are found to feed entirely on neritic and epibenthic organisms. Simenstad et al. (1980) show a gradual decrease in the epibenthic fraction of stomach contents as the chum increase in size.

III. EVALUATING PROPOSED ACTIONS

The standards for determining jeopardy are set forth in section 7(a)(2) of the ESA as defined by 50 C.F.R. Part 402 (the consultation regulations). NMFS must determine whether the action is likely to jeopardize the listed species and/or whether the action is likely to destroy or adversely modify critical habitat. This analysis involves the initial steps of (1) defining the biological requirements and current status of the listed species, and (2) evaluating the relevance of the environmental baseline to the species' current status.

Subsequently, NMFS evaluates whether the action is likely to jeopardize the listed species by determining if the species can be expected to survive with an adequate potential for recovery. In making this determination, NMFS must consider the estimated level of mortality attributable to: (1) collective effects of the proposed or continuing action, (2) the environmental baseline, and (3) any cumulative effects. This evaluation must take into account measures for survival and recovery specific to the listed salmon's life stages that occur beyond the action area. If NMFS finds that the action is likely to jeopardize, NMFS must identify reasonable and prudent alternatives for the action.

Furthermore, NMFS evaluates whether the action, directly or indirectly, is likely to destroy or adversely modify the listed species' designated critical habitat. The NMFS must determine whether habitat modifications appreciably diminish the value of critical habitat for both survival and recovery of the listed species. The NMFS identifies those effects of the action that impair the function of any essential element of critical habitat. The NMFS then considers whether such impairment appreciably diminishes the habitat's value for the species' survival and recovery. If NMFS concludes that the action will adversely modify critical habitat it must identify any reasonable and prudent measures available.

Guidance for making determinations on the issue of jeopardy and adverse modification of habitat are contained in *The Habitat Approach, Implementation of Section 7 of the Endangered Species Act for Actions Affecting the Habitat of Pacific Anadromous Salmonids*, August 1999. This document is attached to this BO as Appendix I.

For the proposed action, NMFS' jeopardy analysis considers direct or indirect mortality of fish attributable to the action. NMFS' critical habitat analysis considers the extent to which the proposed action impairs the function of essential habitat elements necessary for feeding, rearing, migration, predator avoidance and refuge under the existing environmental baseline.

A. Biological Requirements

The first step in the methods NMFS uses for applying the ESA section 7(a)(2) to listed salmon is to define the species' biological requirements that are most relevant to each consultation. NMFS also considers the current status of the listed species taking into account population size, trends, distribution and genetic diversity. To assess the current status of the listed species, NMFS starts with the determinations made in its decision to list Puget Sound chinook and Hood Canal summer chum for ESA protection and also considers new data available that is relevant to the determination.

The relevant biological requirements are those necessary for Puget Sound chinook and Hood Canal summer chum to survive and recover to naturally reproducing population levels at which time protection under the ESA would become unnecessary. Adequate population levels must safeguard the genetic diversity of the listed stocks, and enhance their capacity to adapt to various environmental conditions, and allow them to become self-sustaining in the natural environment.

Five general classes of features or characteristics determine the suitability of aquatic habitats for salmonids: flow regime, water quality, habitat structure, food (energy) source, and biotic interactions (Spence, *et al.*, 1996). For this consultation, water quality, habitat structure and biotic interactions are features NMFS believes may be adversely affected as a result of this project.

B. Factors Affecting Puget Sound Chinook and Hood Canal Summer Chum

NMFS has prepared two supporting documents which describe the factors that have led to the decline of Puget Sound chinook, Hood Canal summer chum, and other salmonids. The first is entitled "Factors for Decline: A Supplement to the Notice of Determination for West Coast Steelhead" (NMFS, 1996). That report concluded that all of the factors identified in section 4(a)(1) of the ESA have played a role in the decline of steelhead and other salmonids, including chinook and chum. The report identifies destruction and modification of habitat, overutilization for commercial and recreational purposes, and natural and human-made factors as being the primary reasons for the decline of west coast steelhead, and other salmonids including chinook and chum. The second document is entitled "Factors Contributing to the Decline of West Coast Chinook Salmon: An Addendum to the 1996 West Coast Steelhead Factors for Decline Report" (NMFS, 1998). This report discusses specific factors affecting chinook salmon. In this report, NMFS concludes that all of the factors identified in section 4(a)(1) of the ESA have played a role in the decline of chinook salmon, and other salmonids. The report identifies destruction and modification of habitat, overutilization for recreational purposes, and natural and human-made factors as being the primary reasons for the decline of chinook salmon and other salmon.

The following discussion summarizes findings regarding factors for decline across the range of chinook and chum salmon. While these factors have been treated here in general terms, it is important to underscore that impacts from certain factors are more acute for specific Evolutionary Significant Units (ESUs). For example, impacts from hydro-power development are more pervasive for ESUs in the Columbia River Basin than for the Puget Sound chinook or Hood Canal summer chum ESUs.

1. <u>The Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range</u>

Chinook and chum salmon in Puget Sound and Hood Canal have experienced declines in abundance in the past several decades as a result of loss, damage or change to their natural environment (Johnson et. al., 1997, NMFS 1998).

2. <u>Overutilization for Commercial, Recreational, Scientific or Educational Purposes</u>

Historically, chinook and chum salmon were abundant in many western coastal and interior waters of the United States. Chinook and chum have supported, and still support important tribal, commercial and recreational fisheries throughout their range, contributing millions of dollars to numerous local economies, as well as providing important cultural and subsistence needs for Native Americans. Over-fishing in the early days of European settlement led to the depletion of many salmon stocks even before extensive habitat degradation. However, following the degradation of many west coast aquatic and riparian ecosystems, exploitation rates were higher than many chinook and chum populations could sustain. Therefore, harvest may have contributed to the further decline of some populations (Johnson et. al., 1997, NMFS 1998).

3. <u>Disease or Predation</u>

Introductions of non-native species and habitat modifications have resulted in increased predator populations in numerous rivers and lakes. Predation of juvenile chinook and chum in marine settings due to loss of nearshore shallow habitat and other shoreline alterations along with predation of adults by marine mammals is also of concern in areas experiencing dwindling numbers of chinook and chum (Johnson et. al., 1997, NMFS 1998).

The proposed action would have some level of effect with the first category above. The extent and duration of such effects and a conclusion regarding the upshot of those effects on Puget Sound chinook and Hood Canal summer chum salmon are provided below.

C. Environmental Baseline

Within the action area, the biological requirements for the Puget Sound chinook and Hood Canal summer chum are not being met under the existing environmental baseline. The summer chum salmon recovery plan (Ames et. al. eds., 2000) rates cumulative impacts to Hood Canal habitat as a major factor for decline of summer chum. Any further degradation of existing conditions would probably increase the risks to listed salmon under the existing baseline conditions.

The action area encompasses the south shore of Hood Canal (Skokomish River to the Union River) is approximately 17 miles long. The proposed project discussed in this BO is located near Belfair, Washington. The Union River, and Tahuya River are nearby systems that produce both chinook and summer chum. The Skokomish River is also nearby, and while it does not support summer chum, it is a major chinook system.

1. <u>Skokomish River</u>

In the Skokomish River system, chinook spawning occurs up to river mile 5.0 in the South Fork, and is limited to below river mile 13.0 in the North Fork - because the Cushman Dam blocks further upstream access. Intensive logging activity has compromised the quality of chinook spawning habitat in the South Fork.

2. <u>Union & Tahuya Rivers</u>

The Union and Tahuya rivers both have low numbers of spawning chinook. Chinook spawning in the Union River is limited to within the first five river miles. Spawning in the Tahuya river can occur slightly above river mile 7.

The Union River summer chum are identified as a separate stock from other Hood Canal summer chum. The spawning of this stock takes place earlier than in other systems. The production of the Union River summer chum is dependent on wild spawning. No hatchery releases of summer chum into the Hood Canal have been made. Spawning in the Union River is within the first five river miles but predominately in the lower mile of the watershed. In contrast to other summer chum production streams within the region, the Union River summer chum escapement has been stable in abundance in recent years relative to historical (Ames et. al., 2000). In the 1970s, the Union River summer chum were less abundant that in the Tahuya, increasing in abundance as the Tahuya declined. It is unclear why the Union run increased during the 1980s and 1990s while other stocks experienced significant declines, several becoming extinct (Ames et. al., 2000). Spawning in the Tahuya River is within the first 10 river miles.

3. <u>Shoreline</u>

Hood Canal straddles a sharp break in landform, between the Olympic Mountains to the west and the Willamette-Puget Sound Lowland to the east. The Olympic Mountains strongly influence seasonal precipitation and riverflow on the western region, with up to 2.5 m mean annual runoff within the watersheds draining into the western side of Hood Canal, 1.5-2.0 m on the southern edge of the Olympics, and approximately 1 m on the lowlands draining into the eastern side.

Much of the south shore of the Canal is documented surfsmelt (*Hypomesus pretosus pretosus*) spawning grounds in the upper reaches of the intertidal zone (WDFW 1992). In the lower intertidal and shallow subtidal zones along this shore, where kelp, algae, or eelgrass are present, herring (*Clupea harengus pallasi*) spawning occurs. In much of the smelt spawning areas, sandlance (*Ammodytes hexapterus*) also have been found to spawn. In southern Hood Canal herring spawn from mid-January to the end of February. Surf smelt spawn from the middle of September to the end of February. These species of fish are collectively referred to as "baitfish," or "forage fish." These fish are small, pelagic schooling fish which are important as forage for predatory fish (such as adult chinook, chum, and coho salmon), birds and mammals. They provide an important link in the food chain between zooplankton and piscivorus animals.

A concerning element of the environmental baseline is the pile driving which has already taken place. The pile driving was conducted March 1999, during a time when summer chum fry were likely to have been present in the nearshore area. Depending upon surface sediments and underlying strata of sediments, pile driving can affect water quality. Fine silts can spread vertically and horizontally in the water column over a broad area around the pile driving activity. In addition to potential adverse affects on water quality, percussion from the pile driving activity can affect juvenile salmon behavior. This can range from relatively benign responses such as holding migration, or "stacking," in shallow water, to potentially adverse behavior such as moving into deeper water where predation could occur.

Increased sedimentation from pile driving would have the same effect. Fish will actively avoid these areas in the marine shore if they can. The result is moving into deeper water, or "stacking" outside of the sediment plume. Fish caught inside a sediment plume may or may not be adversely affected, depending on a number of variables. These variables include, sediment density in the water column, sediment composition (percent fines/silts), sediment toxicity, and overall fitness of the juvenile fish. The pile driving occurred at high water. Juvenile chum migrating through would have been against the vertical wall of the existing rock bulkhead (Figure 3 - Appendix II). The presence of the bulkhead gives no shallow water refuge for juvenile chum and chinook migrating past this section of the beach at high water. Mean higher high water (MHHW) was estimated to be 2.5 feet up this bulkhead. Spring higher high tides during salmon out-migration would force fish into water over 3.5 feet deep. Potential effects from pile driving during this time exacerbates this adverse baseline condition.

The south shore of Hood Canal (half of the action area) has been carved up into over 900 separate properties. State highway 106 parallels the shore within 150 feet of the ordinary high water (OHW) mark of the tides. It is by this highway that property owners access their properties. In many cases along the shore, buildable home sites have been created with the aid of protective bulkheads installed below the OHW. This has lead to the loss of critical habitat in the form of shallow-water refugia, feeding, and migration habitat for juvenile chinook and chum salmon. The creation of upland sites in this fashion, or the protection of upland sites by bulkheads, have also had significant cumulative impacts on surf smelt and sandlance spawning habitats (WDFW 1992). As noted above, these forage fish are essential secondary producers and are prey for adult chinook and chum salmon.

Much of the south shore of Hood Canal is bulkheaded. Approximately 60% of the smelt spawning grounds in Hood Canal have been destroyed by bulkheads placed in the upper intertidal zone (Pentilla, 1988). Over 17 percent of the existing homes on the south shore of Hood Canal have a pier, ramp, and float over the beach in front of them. Studies by WDFW (1990) have shown that structures over the water effectively shade out marine algae and eelgrass. The Biological Evaluation submitted by the ACOE states there are 162 floats or docks on the south shore of Hood Canal.

Although individual shoreline structures might not impose significant impacts to salmon, the cumulative, contiguous shoreline modifications might have contributed to the present decline of salmon and inhibit the success of future salmon recovery actions (Simenstad, et. al., 1999). As noted above, in front of many of the 900 properties there currently exists a bulkhead and/or a pier, ramp and float structure similar or identical to the proposed project considered by this BO. In one 6.2 mile stretch of beach on the south shore, between Twanoh State Park and Calm Cove, there are currently 88 pier, ramp and float combinations. Cumulatively, the docks along the south shore of Hood Canal, have shaded approximately 2.2 acres of intertidal habitat.[1] The ground beneath these docks will no longer support photosynthesis, hence eelgrass or algae growth.

While as much as 2.2 acres of shallow intertidal habitat has been effectively shaded out from primary production, the cumulative adverse effect on chinook or chum salmon have not been measured. NMFS has calculated the effects on designated critical habitat. Excluding the Skokomish and Union River deltas, it is estimated that there are between 180 and 200 acres of intertidal habitat on the south shore of the Canal. When measured against this figure, the acreage affected by shading represents between 1.1 and 1.2 percent of the total.

Tides along the Pacific coast of North America are of the mixed simidiurnal type; that is, there is a pronounced difference between the levels to which two successive low tides fall, and a lesser but still apparent, difference between the levels reached by two successive high tides. The two lows each day are known as the higher and lower low waters; the two highs are the higher and lower high waters. During the course of a lunar month, there are highest and lowest spring tides, highest and lowest neap tides, and a mean or average tide. During the month there will be a highest or extreme high water spring tide (EHWS), the highest level on the shore that the tide reaches in that month, and a lowest or extreme low water spring tide (ELWS), when the tide ebbs to its lowest level on the shore. Organisms living at the EHWS level on the shore will be wetted only once during the month, and those at the ELWS level will be exposed to air only once during the month. Between these extremes exists a continuum, from mostly air-emersed to mostly water-submersed. It is within these limits that shore organisms sort themselves out into horizontal bands, or zones, with often well-defined upper limits of distribution, and with less clearly defined lower limits of distribution.

[1] If the areal extent of the proposed float is an average-sized float (600 square feet), then approximately 97,200 square feet (2.2 acres) of intertidal beach has been shaded and rendered unproductive ground for eelgrass, or algae production.

Due to this intertidal zonation of organisms attributable to the tides, the biological productivity is not the same across the whole intertidal profile of the beach (Carefoot, 1977). The biological productivity specific to the intertidal “zone” affected by the 2.2 acres described above is more robust than higher tidal elevations. For the purpose of this analysis, it is estimated that the shading from the floats is between plus one foot mean lower low water (MLLW), or, +1.0 feet tidal elevation to -2.0 feet below MLLW. This zone is wetted more than the upper intertidal zones, is well within the photic zone, and is biologically much more productive than zones higher in the intertidal. This is illustrated in Figure 1 of Appendix B where the green band of algae can be followed along the beach from the foreground out to the horizon in this photograph. Figure 4 of Appendix B illustrates the area that will be shaded by the proposed float. When considering this narrow band of biological productivity, the 2.2 acres of degraded habitat becomes more pronounced. The percent of acreage affected on the south shore of Hood Canal within this zone on the beach is between 4.3 and 4.8 percent.

IV. ANALYSIS OF EFFECTS

A. Effects of the Proposed Action

This effects analysis follows the process described in *Making ESA Determinations of Effect for Individual or Grouped Actions at the Watershed Scale* (NMFS, 1996). That process uses a matrix of habitat pathways and indicators (MPI) as a framework to describe the existing environmental baseline and derive an evaluation of effects. Those effects are expressed in terms of whether the activities under the proposed action would restore, maintain, or degrade the aquatic habitat factors that comprise the MPI. The MPI’s aquatic habitat elements include water quality, habitat access, habitat structural elements, dynamics of flow and hydrology, and overall watershed conditions. The indicators assessed in the MPI are constituent elements of the pathways. For example, indicators for the water quality pathway include temperature, sediment/turbidity, and chemical concentrations.

Analytically, this section is organized into direct and indirect effects. The description of direct effects include the adverse effects from construction, and beneficial effects of elements of project design, construction staging, and construction methods that were incorporated into the project to address some adverse direct effects. The description of indirect effects mostly addresses the increased amounts of shading over the substrate, grounding of the float, and water quality issues.

Bulkheads along a beach contribute to increased wave energy, reduced sediment inputs, and increased substrate size. The presence of bulkheads and piers reduce or eliminate the potential for overhanging vegetation. Loss of vegetation reduces inputs of terrestrial insects, detritus and shade. Studies by the Washington State Department of Fisheries (WDFW, 1988) have shown that, as substrate size increases, the epibenthic prey production decreases.

1. Direct Effects

Direct effects are immediate effects of the project on the species or its habitat. Adverse effects to chinook and summer chum, and their habitat could ordinarily occur during construction of the pier, ramp and float facility. However, the pile driving is already complete. Since the float is not going to ground during its installation, direct adverse effects are not expected.

2. Indirect Effects

The pier, ramp, and float may have indirect adverse effects on salmon migration. Simenstad et. al., assessed over 60 direct sources of information and found evidence that juvenile salmon react to shadows and other artifacts in the shoreline environment imposed by shoreline structures. Docks present sharp underwater light contrasts by casting shade under ambient daylight conditions, and they also present sharp underwater light contrasts by casting artificial light under ambient nighttime conditions. The studies summarized in Simenstad, et. al., repeatedly verify that changes in the underwater light environment affect juvenile salmonid physiology and behavior. Laboratory experiments have shown that many behavioral changes (minimum prey capture, first feeding, school dispersion) correspond to a light intensity threshold of 10^{-4} foot candles (f-c), while maximum feeding occurs at light intensities of between 10^{-1} and 1 f-c (Simenstad, *et. al.*, 1999).

These changes may affect fish migration behavior and place them at increased mortality risk. In a number of studies throughout Puget Sound, juvenile salmon have been observed to alter their behavior upon encountering docks during their nearshore migration. These observations, and those of studies which salmonids were guided through dangerous structures (i.e., dam turbines, locks) with artificial lighting, imply that these fish may be exposed to increased sublethal stresses and increased risk of mortality as a consequence of the following (Simenstad, et. al., 1999):

1. Delays in their migration due to disorientation caused by lighting changes.
2. Loss of schooling refugia due to fish school dispersal under light limitation.
3. A change in migratory route into deeper waters, without refugia, to avoid the light change.

Longer term effects from the project will result from the shading and grounding of the float section and possible localized water quality effects around the float and piles. The float will add to the approximately 2.2 acres of shading effects from the existing floats on the south shore. The proposed float is 600 square feet. The exact location of the proposed float is easily determined by the presence of the anchor piles. Figure 4 (Appendix II) shows the substrate that will be affected. This section of the south beach was seeded with oysters in recent years and is the dominant substrate that would be affected. The seeding of oysters was conducted by WDFW (Small, 2000). Shading from the float will preclude the continued existence of algae below. Grounding will adversely affect the oysters. The oysters provide additional surface area on the beach substrate and provide habitat for epibenthic invertebrates upon which juvenile chum and chinook salmon prey.

While oysters are a dominant component of the benthic community, their presence has not precluded the growth of aquatic vegetation. Algae was also a noticeable part of the benthic community and whose growth and future survival will be affected. These algae include *Ulva, Enteromorpha*, and *Monostroma*. Studies by WDFW have shown that the edge of the zone of shading beneath the float structure will sharply define eelgrass and algal growth (Pentilla 1989).

Light energy drives plant photosynthesis processes. These processes are modified by the synergistic effects of nutrient concentrations, temperature, salinity, and wave action that control the quality and quantity of available light, as well as the plants' physical environment. Modification to these variables beneath an over-hanging structure, although relatively localized, influence the rate of photosynthesis, plant distribution, and survival of specific plant species that directly or indirectly support juvenile salmonid prey resource composition and production.

Juvenile salmon encounter limited prey resources under shoreline structures when important habitats such as eelgrass (*Zostera marina*) and algae are disturbed. Epibenthic crustaceans are the prey resources of most concern because they are usually associated with nearshore plants that are affected by over-water structures.

The eight piles, and six grounding blocks (under the float) have been treated with ammoniacal copper zinc arsenate (ACZA).   In the freshwater environment, copper is the main metal of concern from this treatment because it is the most acutely toxic. Also, in freshwater, copper leaches the most, followed by arsenic and chromium (NMFS, 1998). It is not known however, the fate of these heavy metals in the marine environment. Due to the pH of marine water, significant leaching of these metals is not expected. However, some leachate of metals from the treated wood will undoubtably occur on exposed parts of the piling and other treated woods when it rains, and localized, potentially adverse water quality effects may result.

B. Effects on Critical Habitat

NMFS designates critical habitat for a listed species based on physical and biological features that are essential to that species. In designating critical habitat, NMFS considers the following requirements of the species: (1) Space for individual and population growth, and for normal behavior; (2) food, water, air, light, minerals, or other nutritional or physiological requirements; (3) cover or shelter; (4) sites for breeding, reproduction, or rearing of offspring; and, generally, (5) habitats that are protected from disturbance or are representative of the historical geographical and ecological distributions of the species. In addition to these factors, NMFS also focuses on the known physical and biological features within the designated area that are essential to the conservation of the species and that may require special management considerations or protection. These essential features may include, but are not limited to, spawning sites, refuge and migration corridors, food resources, water quality and quantity, and riparian vegetation.

Critical habitat for the Puget Sound chinook includes all marine estuarine and river reaches accessible to listed chinook salmon in Puget Sound (65 Fed. Reg. 7764; February 16, 2000).

Critical habitat for Hood Canal summer chum includes all river reaches accessible to listed chum salmon, including estuarine areas and tributaries, draining into Hood Canal as well as Olympic Peninsula rivers between and including Hood Canal and Dungeness Bay, Washington (65 Fed. Reg. 7764; February 16, 2000).

NMFS expects that the effects from this proposal will have a slight incremental adverse impact on designated critical habitat. An additional 600 square feet of nearshore intertidal habitat will be shaded and within this area, primary productivity (photosynthesis) will cease. This loss of production will be minor, yet will contribute to the cumulative effect on epibenthic invertebrate production in Hood Canal. As stated above, epibenthic invertebrates are essential prey organisms for juvenile chinook and chum salmon in the marine environment.

C. Cumulative Effects

Cumulative effects are defined in 50 C.F.R. 402.02 as "those effects of future State or private activities, not involving Federal Activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation." For the purposes of this analysis, cumulative effects for the general action area are considered. Future Federal actions, such as issuance of ACOE permits for other in-water construction projects will be reviewed through separate section 7 consultation processes and are therefore not considered in this analysis.

The south shore of Hood Canal is primarily residential. Much of this shoreline has been developed. However, there are still many properties which have not yet been developed and it is reasonable to expect that further development will occur. Such projects would involve clearing, grading, and site preparation activities to construct single-family dwellings. This will result in further reduction of shoreline vegetation. As shoreline development continues, it is reasonable to expect that this would cause potential adverse affects. The loss of over-hanging vegetation above the upper intertidal zone, in particular, could result in adverse modifications to smelt and sandlance spawning grounds. Incubating forage fish eggs need shade to protect them from dessication (WDFW 1992). Loss of shoreline vegetation would also lead to a reduction in detrital inputs and terrestrial insects. Detrital inputs are important in providing substrates for microbial decay which leads to the production of epibenthic prey organisms for juvenile salmon. Reductions in terrestrial insects is a direct loss to the salmon prey base. Loss of shoreline vegetation can also lead to bank destabilization and the need for a protective bulkhead. Additional bulkheads could result in the loss of more smelt and sandlance spawning habitats. In addition, continued development of the shore can alter groundwater seepage onto the beach. Freshwater inputs to the intertidal shore, where they naturally occur, are critical to the properly functioning biological condition of that shore.

The loss of aquatic plant production has other cumulative effects on the nearshore. Organic carbon is significant to primary and secondary producers in the marine environment. Organic carbon comes in the form of decaying plants. Plants can be of terrestrial or aquatic origin. With the uplands along the south shore of Hood Canal altered from historic riparian vegetation to mostly bulkheads and/or residences, the most significant inputs of organic carbon remaining are from the larger rivers and from aquatic plant production. Decaying aquatic plants, or detritus, is a significant source of food energy via microorganisms (bacteria, fungi, viruses) for many epibenthic invertebrates, including those important in the diet of juvenile salmonids. The proposed project will have an immeasurable, yet incremental affect on organic carbon production. In turn, this loss of production will incrementally affect detrital inputs, microbial decay, and epibenthic prey production.

V. CONCLUSION

Despite adding to cumulative effects on already degraded critical habitat, NMFS has determined, based on the information available, that the effects of the proposed action would not likely jeopardize the continued existence of Puget Sound chinook or Hood Canal summer chum salmon. NMFS has also determined there will not be an adverse modification of their designated critical habitat, primarily because eelgrass and forage fish spawning will not be displaced. NMFS used best available scientific and commercial data in this analysis. The analysis was completed by comparing the expected effects of the proposed action on elements of the species' biological requirements, together with cumulative effects, to the environmental baseline. NMFS applied applicable portions of the watershed-based evaluation methodology (NMFS 1996) to the proposed action and found that it would cause short-term and long-term adverse degradation of anadromous salmonid habitat due to habitat loss. Juvenile salmon may react to the physical presence of the pier, ramp and float structure by altering migration and behavioral patterns to an unknown degree.

Changes to designated critical habitat, and potential reductions in salmonid fitness (or survival) may occur later in time as a result of indirect and cumulative effects. This effect would result from reductions in carrying capacity. In making this determination, NMFS considered the following sequence: increased shading, loss of primary productivity, reduction in detrital inputs, microbial decay, and finally, epibenthic invertebrate (salmonid prey-base) production. Unfortunately, studies have not been conducted along this shore to determine the significance of this effect.

NMFS has determined that adverse affects to forage fish spawning habitat are not likely. Site inspections by NMFS in May 2000, found the immediate habitat area unsupportive for herring spawning, and the structure should not impair potential spawning of surf smelt or sandlance.

VI. REINITIATION OF CONSULTATION

Consultation must be reinitiated if: the amount or extent of taking specified in the Incidental Take Statement is exceeded, or is expected to be exceeded; new information reveals effects of the action may affect listed species in a way not previously considered; the action is modified in a way that causes an effect on listed species that was not previously considered; or, a new species is listed or critical habitat is designated that may be affected by the action (50 C.F.R. 402.16).

VII. INCIDENTAL TAKE STATEMENT

Sections 4 (d) and 9 of the ESA prohibit any taking (harass, harm pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct) of listed species without a specific permit or exemption. Harm is further defined by NMFS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, and sheltering (50 C.F.R. Part 222; November 8, 1999). Harass is defined as actions that create the likelihood of injuring listed species to such an extent as to significantly alter normal behavior patterns which include, but are not limited to, breeding, feeding, and sheltering. Incidental take is take of liste animal species that results from, but is not the purpose of, the Federal agency or the applicant carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action is not considered prohibited taking provide that such taking is in compliance with the terms and conditions of this incidental take statement.

An incidental take statement specifies the impact of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize impacts and sets forth terms and conditions with which the action agency must comply in order to implement the reasonable and prudent measures.

A. Amount or Extent of the Take

The NMFS anticipates that the incidental take of Puget Sound chinook and Hood Canal summer chum salmon could result from project activities as described in the BA and BO. Despite the use of the best scientific and commercial data available, NMFS cannot estimate a specific amount of incidental take of individual fish. However, the mechanisms of expected effects are explained below. The extent to which these mechanisms may result in effects on salmon or salmon habitat can be described qualitatively, enabling reinitiation of consultation if such effects are exceeded during the project.

Placement of the ramp and attaching the float to the anchor piles will not cause additional harassment because there will be no in-water construction, and this phase of the construction activity will be conducted when migrating and feeding juvenile salmonids are not expected to be present.

NMFS believes three mechanisms of take may occur. The first mechanism of take could occur as a result of the increased shading below the float and the subsequent loss of primary and secondary productivity leading to a loss in epibenthic prey for juvenile chinook and chum salmon. While on a cumulative basis, this shading and loss of productivity could and will have lasting and local adverse affects, NMFS does not believe that this singular dock and associated indirect and cumulative affects will jeopardize the continued existence of Puget Sound chinook and Hood Canal summer chum salmon.

A second form of take may occur by altering the shoreline migration of juvenile salmon. Because juvenile summer chum and ocean-type chinook salmon tend to migrate in shallow-water habitats along estuarine and marine shorelines, over-water structures may present physical and behavioral barriers. This can cause these fish to divert into deeper water, thereby increasing their exposure to predators. Forcing juvenile salmon into deeper water might further affect salmon survival by decreasing their growth because of limited availability of the appropriate prey resources. The cumulative impact of these structures (now 163 on the south shore) could be an overall reduction in survival rate as juveniles traverse through Hood Canal (Simenstad, et. al., 1999).

Finally, localized water quality impacts from the ACZA-treated piles and grounding blocks could cause harm to juvenile salmon. This effect could be from direct exposure, or indirectly by reducing prey abundance. NMFS recognizes that these effects will be difficult to quantify, and in the marine environment, potential adverse affects could be short-lived.

B. Reasonable and Prudent Measures

The NMFS believes that the following reasonable and prudent measures are necessary and appropriate to minimizing take of the Puget Sound chinook and Hood Canal summer chum salmon.

1. The ACOE shall require the applicant to rake the oysters out of the 600 square foot area expected to be impacted by the grounding of the float (not just beneath the grounding blocks).

2. The management and construction provisions of the Hydrualic Project Approval are incorporated by reference.

C. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the applicant must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1. As per #2 above, the oysters shall be hand picked or carefully raked aside. These oysters shall be kept at the same tidal elevation and not placed on top of:

(a) any existing oysters, or
(b) other macro-invertebrates, or
(c) macro-algae, or
(d) eelgrass.

This will preserve the beneficial effects they provide the nearshore ecosystem, including effects on salmonid production.

2. The terms and conditions of the Hydraulic Project Approval, will be fully implemented.

VIII. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or designated critical habitat, to help implement recovery plans, or to develop additional information.

At low tide the float is designed to rest on six grounding blocks which have a footprint of 192 square feet. However, in soft ground, such as the case on this beach, the grounding blocks will sink, and the 600 square-foot float will ground out. This will occur on nearly a daily, and sometimes, twice daily basis. This smothering effect may render the benthic habitat less productive biologically over a fairly short period of time. This impact will contribute to the baseline condition established by the previously installed structures of this kind and the other shoreline modifications.

This affect can be mitigated. Stop-collars or similarly engineered devices could be attached to the anchor piles to keep the float slightly elevated above the ground during low tides. As the tide recedes, the float would come to rest on these stopping devices rather than onto the ground. The ACOE should consider requiring apparatus of this nature in permitting structures of this kind.

NMFS strongly recommends that all in-water construction activities should not be allowed from February 15 through July 15 of any year for the protection of water quality and migrating juvenile salmonids.

IX. REFERENCES

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Appendix I

The Habitat Approach, Implementation of Section 7 of the ESA for Actions Affecting The Habitat of Pacific Anadromous Salmonids

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